

WHAT IS CLAIMED IS:

1. A centering mechanism for a lens for centering a lens when a lens holding member holding said lens is mounted on a main body unit of a lens barrel, comprising

support means for positioning said lens holding member with respect to said main body unit of the lens barrel within a plane perpendicular to the optical axis of said lens and for carrying said lens holding member for movement in a direction along said optical axis; and

adjustment means including a plurality of adjustment members, rotationally mounted on at least three sites on the outer peripheral surface of said main body unit of the lens barrel, said adjustment members being rotated to displace said lens holding members in a direction along the optical axis for adjusting the tilt of the lens held by said lens holding member.

2. The lens centering mechanism according to claim 1 wherein said adjustment member includes an offset portion offset relative to the center of rotation thereof, said adjustment member being rotated as said offset portion is engaged in an engagement hole provided in an outer rim of said lens holding member to displace said lens holding member in the direction along the optical axis.

3. The lens centering mechanism according to claim 2 wherein said adjustment member includes a shaft hole engaged by a pivot shaft provided to the outer peripheral surface of said main body unit of the lens barrel and is rotationally

mounted on the outer peripheral surface of said main body unit of the lens barrel by engagement of said pivot shaft in said engagement hole.

4. The lens centering mechanism according to claim 2 wherein said adjustment member includes a pivot shaft engaged in a shaft hole provided in the outer peripheral surface of said main body unit of the lens barrel and is rotationally mounted on the outer peripheral surface of said main body unit of the lens barrel by engagement of said pivot shaft in said engagement hole.

5. The lens centering mechanism according to claim 1 wherein said adjustment member is arranged on the outer peripheral surface of the main body unit of the lens barrel on sites substantially trisecting the outer rim of the lens held by said lens holding member along the circumferential direction thereof.

6. The lens centering mechanism according to claim 1 wherein said support means includes a guide pin provided to one of facing mounting surfaces of said lens holding member and said main body unit of the lens barrel, for extending in a direction parallel to the optical axis of said lens, and a guide hole formed in the other of said facing mounting surfaces, for extending in a direction parallel to the optical axis of said lens, said guide pin being inserted into said guide hole for positioning said lens holding member relative to said main body unit of the lens barrel in a plane perpendicular to the optical axis of the lens and for supporting the lens holding member for movement in the direction along the optical axis.

7. The lens centering mechanism according to claim 6 wherein said support

means is provided on at least two sites of said mounting surface.

8. The lens centering mechanism according to claim 2 further comprising biasing means for biasing the lens holding member towards one side in the direction along the optical axis.

9. The lens centering mechanism according to claim 8 wherein said biasing means is a plurality of torsion coil springs, each having one end retained by the outer peripheral surface of said lens holding member and having the other end retained by the outer peripheral surface of said main body unit of the lens barrel, and wherein said lens holding member is biased towards one side in the direction along the optical axis under the force of elasticity of said torsion coil springs.

10. The lens centering mechanism according to claim 8 wherein said adjustment member includes a flanged portion protruded from a site of said offset portion facing outwards from said engagement hole, in a radius enlarging direction, said flanged portion engaging in a groove formed in said lens holding member, as said offset portion is biased by said biasing means towards one side in the direction along the optical axis into abutment against one end of said engagement hole, in such a manner as to prevent withdrawal of said adjustment member from said engagement hole.

11. The lens centering mechanism according to claim 2 wherein said adjustment member includes a tongue protruded from the outer rim of said offset portion, said tongue intruding into a gap between said lens holding member and the main

body unit of the lens barrel, as said offset portion is abutted against both ends in the direction along the optical axis of said engagement hole, in such a manner as to prevent withdrawal of said adjustment member from said engagement hole.

12. A lens apparatus comprising:

a plurality of lenses for forming an image of an object;

a lens holding member for holding at least one of said lenses;

a main body unit of a lens barrel mounting said lens holding member, said main body unit of the lens barrel carrying said plural lenses mounted therein on a common optical axis;

support means for positioning said lens holding member with respect to said main body unit of the lens barrel in a plane perpendicular to an optical axis of said lens and for carrying said lens holding member for movement in a direction along the optical axis; and

adjustment means including a plurality of adjustment members, rotationally mounted on at least three sites on the outer peripheral surface of said main body unit of the lens barrel, said adjustment member being rotated to displace said lens holding member in a direction along the optical axis for adjusting the tilt of the lens held by said lens holding member.

13. The lens apparatus according to claim 12 wherein said adjustment member includes an offset portion offset relative to the center of rotation thereof, said adjustment member displacing said lens holding member in a direction along

the optical axis as the adjustment member is rotated with the offset portion engaging in an engagement hole provided to the outer rim of said lens holding member.

14. The lens apparatus according to claim 13 wherein said adjustment member has a shaft hole engaged by a pivot shaft provided to the outer peripheral surface of the main body unit of the lens barrel and is rotationally mounted to the outer peripheral surface of said main body unit of the lens barrel by engagement of said pivot shaft in said shaft opening.

15. The lens apparatus according to claim 13 wherein said adjustment member has a pivot shaft hole engaged in a shaft hole provided to the outer peripheral surface of the main body unit of the lens barrel and is rotationally mounted to the outer peripheral surface of said main body unit of the lens barrel by engagement of said pivot shaft in said shaft opening.

16. The lens apparatus according to claim 12 wherein said adjustment member is arranged on the outer peripheral surface of the main body unit of the lens barrel on sites substantially trisecting the outer rim of the lens held by said lens holding member into three substantially equal portions along the circumferential direction thereof.

17. The lens apparatus according to claim 12 wherein said support means includes a guide pin provided to one of facing mounting surfaces of said lens holding member and said main body unit of the lens barrel, for extending in a

direction parallel to the optical axis of said lens, and a guide hole formed in the other of said facing mounting surfaces, for extending in a direction parallel to the optical axis of said lens, said guide pin being inserted into said guide hole for positioning said lens holding member relative to said main body unit of the lens barrel in a plane perpendicular to the optical axis of the lens and for supporting the lens holding member for movement in the direction along the optical axis.

18. The lens apparatus according to claim 17 wherein said support means is provided on at least two sites of said mounting surface.

19. The lens apparatus according to claim 13 further comprising biasing means for biasing the lens holding member towards one side in the direction along the optical axis.

20. The lens apparatus according to claim 19 wherein said biasing means is a plurality of torsion coil springs, each having one end retained by the outer peripheral surface of said lens holding member and having the other end retained by the outer peripheral surface of said main body unit of the lens barrel and wherein said lens holding member is biased towards one side in the direction along the optical axis under the force of elasticity of said torsion coil spring.

21. The lens apparatus according to claim 19 wherein said adjustment member includes a flanged portion protruded from a site of said offset portion facing outwards from said engagement hole, in a radius enlarging direction, said flanged portion engaging in a groove formed in said lens holding member, as said offset

portion is biased by said biasing means towards one side in the direction along the optical axis into abutment against one end of said engagement hole, in such a manner as to prevent withdrawal of said adjustment member from said engagement hole.

22. The lens apparatus according to claim 13 wherein said adjustment member includes a tongue protruded from the outer rim of said offset portion, said tongue intruding into a gap between said lens holding member and the main body unit of the lens barrel, as said offset portion is abutted against both ends in the direction along the optical axis of said engagement hole, in such a manner as to prevent withdrawal of said adjustment member from said engagement hole.

23. An imaging apparatus comprising:

a plurality of lenses for forming an image of an object;  
a lens holding member for holding at least one of said lenses;  
a main body unit of a lens barrel mounting said lens holding member, said main body unit of the lens barrel carrying said plural lenses mounted therein on a common optical axis;

imaging means for photographing an image of an object formed by said lenses;

support means for positioning said lens holding member with respect to said main body unit of the lens barrel in a plane perpendicular to an optical axis of said lens and for carrying said lens holding member for movement in a direction along

the optical axis; and

adjustment means including a plurality of adjustment members, rotationally mounted on at least three sites on the outer peripheral surface of said main body unit of the lens barrel, said adjustment member being rotated to displace said lens holding members in a direction along the optical axis for adjusting the tilt of the lens held by said lens holding member.

24. The imaging apparatus according to claim 23 wherein said adjustment member includes an offset portion offset relative to the center of rotation thereof, said adjustment member displacing said lens holding member in a direction along the optical axis as the adjustment member is rotated with the offset portion engaging in an engagement hole provided to the outer rim of said lens holding member.

25. The imaging apparatus according to claim 24 wherein said adjustment member has a shaft hole engaged by a pivot shaft provided to the outer peripheral surface of the main body unit of the lens barrel and is rotationally mounted to the outer peripheral surface of said main body unit of the lens barrel by engagement of said pivot shaft in said shaft opening.

26. The imaging apparatus according to claim 24 wherein said adjustment member has a pivot shaft hole engaged in a shaft hole provided to the outer peripheral surface of the main body unit of the lens barrel and is rotationally mounted to the outer peripheral surface of said main body unit of the lens barrel by

engagement of said pivot shaft in said shaft opening.

27. The imaging apparatus according to claim 23 wherein said adjustment members are arranged on the outer peripheral surface of the main body unit of the lens barrel on sites trisecting the outer rim of the lens held by said lens holding member into three substantially equal portions along the circumferential direction thereof.

28. The imaging apparatus according to claim 23 wherein said support means includes a guide pin provided to one of facing mounting surfaces of said lens holding member and said main body unit of the lens barrel, for extending in a direction parallel to the optical axis of said lens, and a guide hole formed in the other of said facing mounting surfaces, for extending in a direction parallel to the optical axis of said lens, said guide pin being inserted into said guide hole for positioning said lens holding member relative to said main body unit of the lens barrel in a plane perpendicular to the optical axis of the lens and for supporting the lens holding member for movement in the direction along the optical axis.

29. The imaging apparatus according to claim 28 wherein said support means is provided on at least two sites of said mounting surface.

30. The imaging apparatus according to claim 24 further comprising biasing means for biasing the lens holding member towards one side in the direction along the optical axis.

31. The imaging apparatus according to claim 30 wherein said biasing means is a

plurality of torsion coil springs, each having one end retained by the outer peripheral surface of said lens holding member and having the other end retained by the outer peripheral surface of said main body unit of the lens barrel and wherein said lens holding member is biased towards one side in the direction along the optical axis under the force of elasticity of said torsion coil spring.

32. The imaging apparatus according to claim 30 wherein said adjustment member includes a flanged portion protruded from a site of said offset portion facing outwards from said engagement hole, in a radius enlarging direction, said flanged portion engaging in a groove formed in said lens holding member, as said offset portion is biased by said biasing means towards one side in the direction along the optical axis into abutment against one end of said engagement hole, in such a manner as to prevent withdrawal of said adjustment member from said engagement hole.

33. The imaging apparatus according to claim 24 wherein said adjustment member includes a tongue protruded from the outer rim of said offset portion, said tongue intruding into a gap between said lens holding member and the main body unit of the lens barrel, as said offset portion is abutted against both ends in the direction along the optical axis of said engagement hole, in such a manner as to prevent withdrawal of said adjustment member from said engagement hole.